

Correlation of Gestational Age with Fetal Renal Length in Third Trimester Pregnancy

¹Dr. Aayushi Jain, Post Graduate, Department of Obstetrics and Gynaecology, ASCOMS and Hospital, Sidhra, Jammu, Jammu and Kashmir, India

²Dr. Sapna Puri, HOD, Department of Obstetrics and Gynaecology, ASCOMS and Hospital, Sidhra, Jammu, Jammu and Kashmir, India

³Dr. Swasti Slathia, Post Graduate, Department of Obstetrics and Gynaecology, ASCOMS and Hospital, Sidhra, Jammu, Jammu and Kashmir, India

Corresponding Author: Dr. Aayushi Jain, Post Graduate, Department of Obstetrics and Gynaecology, ASCOMS and Hospital, Sidhra, Jammu, Jammu and Kashmir, India

How to citation this article: Dr. Aayushi Jain, Dr. Sapna Puri, Dr. Swasti Slathia, “Correlation of Gestational Age with Fetal Renal Length in Third Trimester Pregnancy”, IJMACR- June - 2025, Volume – 8, Issue - 3, P. No. 250 – 256.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To evaluate the accuracy of fetal kidney length on ultrasound as a reliable indicator of gestational age in the third trimester.

Materials and methods: This hospital-based observational study is a prospective study conducted over a period of one year on 100 antenatal patients fulfilling the inclusion criteria, at the Department of Obstetrics and Gynecology, Acharya Shri Chander College of Medical Sciences, Sidhra, Jammu, after obtaining written informed consent and institutional ethical clearance. Pregnant women with singleton pregnancies in the third trimester (28 to 40 weeks), with regular menstrual cycles and known last menstrual period, and no associated risk factors were included.

Results were expressed as mean $\pm$ standard deviation. Data analysis was done using SSPS software.

Results: The data indicate a progressive increase in FKL with advancing gestational age. At 28 weeks, the average FKL was 31.2 mm (SD $\pm$ 1.7), increasing steadily to 32.3 mm (SD $\pm$ 2.3) at 29 weeks, and 33.7 mm (SD $\pm$ 1.5) at 30 weeks. This trend continues through the third trimester, with FKL measuring 36.1 mm (SD $\pm$ 1.9) at 32 weeks, 38.8 mm (SD $\pm$ 2.5) at 34 weeks, and reaching 42.6 mm (SD $\pm$ 1.9) by 40 weeks.

Conclusion: The consistent rise in FKL with gestational age supports its potential utility as a reliable parameter for estimating GA in the third trimester.

Keywords: fetal, gestational, Kidney

Introduction

Precise determination of gestational age (GA) is a fundamental aspect of obstetric care, as errors in dating can lead to complications such as iatrogenic prematurity or prolonged pregnancies, both of which carry increased risks of perinatal morbidity and mortality. The advent and widespread use of ultrasonography over the past two decades have greatly enhanced the ability to assess GA accurately. Commonly used sonographic parameters include Biparietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC), and Femur Length (FL). However, these traditional biometric markers may be affected by various maternal and fetal conditions such as oligohydramnios, polyhydramnios, breech presentation, multiple gestations, and intrauterine growth restriction (IUGR), leading to potential inaccuracies in GA estimation, particularly in the third trimester.^{1,2,3}

Most conventional biometric parameters tend to lose reliability in the later stages of pregnancy due to increasing variability in fetal size relative to gestational age. However, emerging evidence suggests that fetal kidney length (FKL) maintains a consistent correlation with gestational age across various stages of pregnancy. The progressive growth of fetal kidneys, like other developing organs, provides a dependable basis for gestational dating. Although the anteroposterior dimensions of the kidneys may vary, studies have shown that FKL remains largely unaffected by maternal medical conditions, including obesity and fetal growth restriction (FGR).^{4,5}

FKL increases at a relatively steady rate of approximately 1.7 mm every 15 days throughout gestation, even in the presence of conditions like FGR. This consistent growth pattern makes it a simple and

reliable measurement for estimating gestational age. Despite its potential, there is limited research on FKL as a dating tool in our population. This study aims to fill that gap by evaluating fetal kidney length from 24 weeks of gestation onward and examining its correlation with gestational age. The findings are also compared with established biometric indices such as BPD, HC, AC, and FL, to assess whether FKL could serve as a valuable adjunct or alternative in gestational dating protocols.^{6,7}

As a result, attention has shifted toward identifying alternative or supplementary parameters that remain reliable in late pregnancy. Fetal Kidney Length (FKL) has emerged as one such parameter, demonstrating a strong linear correlation with gestational age, especially beyond 24 weeks. Unlike traditional indices, FKL is less influenced by fetal growth variations and amniotic fluid levels, offering a more stable marker in the later stages of gestation.^{8,9}

Materials and Methods

This hospital-based observational study is a prospective study conducted over a period of one year on 100 antenatal patients fulfilling the inclusion criteria, at the Department of Obstetrics and Gynecology, Acharya Shri Chander College of Medical Sciences, Sidhra, Jammu, after obtaining written informed consent and institutional ethical clearance. Pregnant women with singleton pregnancies in the third trimester (28 to 40 weeks), with regular menstrual cycles and known last menstrual period, and no associated risk factors were included.

Exclusion criteria comprised maternal factors like unknown dates, multiple pregnancies, high-risk conditions (e.g., pre-eclampsia, macrosomia, oligohydramnios/polyhydramnios), and obesity; and fetal factors like anomalies, IUGR, offspring of diabetic mothers, renal anomalies, and obscured renal/adrenal

borders. During ultrasound, the fetus was scanned transversely to visualize the kidney below the stomach, and the probe was rotated 90° during apnea to obtain the longitudinal kidney axis. Right and left kidney lengths were measured twice by a single sonographer using an ultrasound machine, and the mean kidney length was

used to estimate gestational age. Results were expressed as mean $\pm$ standard deviation. Data analysis was done using SSPS software.

Results and Discussion

Table 1: GA correlation with BPD

GA in weeks	Average BPD (in mm)	SD in mm
28	70.2	2.63
29	72.5	2.79
30	73.7	2.91
31	74.7	3.83
32	76.8	4.90
33	77.9	3.98
34	78.9	5.75
35	79.5	4.99
36	82.6	3.81
37	83.4	3.97
38	85.0	3.62
39	87.6	2.55
40	89.8	4.25

GA: Gestational age, BPD: Biparietal diameter, SD: Standard deviation

Table 2: GA versus HC

GA in weeks	HC in mm	SD in mm
28	249	8.22
29	257	13.42
30	276	12.53
31	283	12.44
32	298	8.82
33	301	9.89
34	313	10.73
35	327	12.96
36	333	13.08

37	345	15.7
38	347	18.32
39	352	10.31
40	342	17.43

GA: Gestational age, HC: Head circumference, SD: Standard deviation

Table 3: GA versus AC

GA in weeks	AC in mm	SD in mm
28	243	9.3
29	247	7.5
30	253	11.9
31	261	12.3
32	269	7.6
33	273	8.7
34	281	9.3
35	289	8.8
36	294	7.6
37	304	9.8
38	305	6.4
39	313	4.9
40	320	5.4

GA: Gestational age, AC: Abdominal circumference, SD: Standard deviation

Table 4: GA versus FL

GA in weeks	FL in mm	SD in mm
28	49.8	2.9
29	50.7	2.6
30	52.3	2.8
31	54.4	3.6
32	55.7	3.9
33	58.9	4.4
34	60.8	4.9
35	62.6	3.8
36	64.4	3.2

37	66.8	4.2
38	68.1	3.9
39	69.9	2.7
40	70.4	2.9

GA: Gestational age, FL: Femur length, SD: Standard deviation

Table 5: GA versus fetal renal length in mm

GA in weeks	Average FKL in mm	SD in mm
28	31.2	1.7
29	32.3	2.3
30	33.7	1.5
31	34.5	2.3
32	36.1	1.9
33	37.9	1.2
34	38.8	2.5
35	39.7	1.6
36	40.1	1.9
37	40.9	2.8
38	41.3	1.7
39	41.8	1.6
40	42.6	1.9

GA: Gestational age, FKL: Fetal kidney length, SD: Standard deviation

The data indicate a progressive increase in FKL with advancing gestational age. At 28 weeks, the average FKL was 31.2 mm (SD ± 1.7), increasing steadily to 32.3 mm (SD ± 2.3) at 29 weeks, and 33.7 mm (SD ± 1.5) at 30 weeks. This trend continues through the third trimester, with FKL measuring 36.1 mm (SD ± 1.9) at 32 weeks, 38.8 mm (SD ± 2.5) at 34 weeks, and reaching 42.6 mm (SD ± 1.9) by 40 weeks.

The accurate assessment of gestational age (GA) in the third trimester is crucial for optimal prenatal care, timely intervention, and planning of delivery. While traditional biometric parameters such as biparietal diameter (BPD), head circumference (HC), abdominal circumference

(AC), and femur length (FL) are commonly used, their reliability may decrease in late pregnancy due to biological variability. In recent years, fetal renal length—specifically the measurement of fetal kidney length (FKL)—has emerged as a potentially dependable marker for estimating GA in the third trimester. The fetal kidneys grow at a relatively consistent rate throughout gestation, and their measurement via ultrasonography offers a non-invasive and reproducible method. This study aims to explore the correlation between GA and FKL, assessing its usefulness as an adjunct or alternative parameter for gestational age estimation during the later stages of pregnancy.^{10,11}

In the study by Das et al.,¹² the objective was to establish normative fetal kidney length (FKL) ranges during the third trimester of pregnancy and compare its accuracy in estimating gestational age (GA) with conventional biometric parameters. Conducted on 152 uncomplicated singleton pregnancies between 28 and 40 weeks of gestation, the study used Pearson's correlation coefficient to assess the relationship between FKL and standard parameters such as biparietal diameter, head circumference, abdominal circumference (AC), and femur length. FKL demonstrated the strongest correlation with GA ($r = 0.907$, $R^2 = 0.822$), followed by AC ($r = 0.901$), with statistical significance at $P < 0.05$. The findings indicate that FKL can be a reliable adjunct to routine obstetric scans for accurate GA estimation, especially in cases where conventional parameters are difficult to measure due to fetal head engagement, asynclitism, or breech presentation.

In the study by Peter M et al.¹³, the role of fetal kidney length (FKL) in estimating gestational age (GA) was evaluated and compared with established biometric indices such as biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL). This cross-sectional study included healthy pregnant women between 20 weeks of gestation to term who were certain of their last menstrual period and had regular menstrual cycles. The maximum length of a single fetal kidney was measured from the upper to lower pole three times, with the mean value used for analysis. Data were processed using SPSS version 21, with additional tools like Microsoft Word and Excel for graphs and tables. Results from linear regression analysis indicated that FKL could predict GA with an accuracy of ± 9.048 days, which improved to ± 8.299 days when combined with other biometric

indices. The study concluded that FKL correlates well with GA and, when used alongside conventional parameters, can provide a reliable estimation of gestational age.

In the study by Al-Mlah S et al.¹⁴, the accuracy of fetal kidney length (FKL) in estimating gestational age (GA) was assessed in normal singleton pregnancies. The results demonstrated that FKL is a reliable indicator of GA and can be used independently, especially in the third trimester when conventional parameters such as biparietal diameter (BPD), femur length (FL), and abdominal circumference (AC) may become less accurate. A notable finding was the consistent difference between right and left kidney lengths, with the left being slightly larger. The study concluded that mean kidney length (MKL) closely corresponds to gestational age in weeks, supporting the use of FKL as a useful tool in estimating GA when menstrual dates are uncertain.

A limitation of our study is the relatively small sample size, which may affect the generalizability and statistical power of the findings. As a result, the outcomes observed may not fully represent the broader population, and variations in results could occur with larger or more diverse study groups.

Conclusion

The consistent rise in FKL with gestational age supports its potential utility as a reliable parameter for estimating GA in the third trimester.

References

1. MacGregor SN, Sabbagha RE. Assessment of gestational age by ultrasound. *Glob libr women's med*. 2008. DOI 10.3843/GLOWM.10206
2. Susan Stranding. *Gray's anatomy the anatomical basis of clinical practice*, 39th edition, Elsevier Churchill livingstone, Edinburgh. 2005.

3. Benson CB, Doubilet PM. Sonographic prediction of gestational age: accuracy of second-and third-trimester fetal measurements. *AJR. Am J roentgenology*. 1991;157(6):1275-7.
4. Cohen HL, Cooper J, Eisenberg P, Mandel FS, Gross BR, Goldman MA, Barzel E, Rawlinson KF. Normal length of fetal kidneys: sonographic study in 397 obstetric patients. *AJR. Am J Roentgenology*. 1991;157(3):545-8.
5. Morgan JA, Cooper DB. *Cooper DB-Pregnancy Dating*, Sep. Treasure Island, FL: StatPearls Publishing; 2022. *Pregnancy Dating*.
6. Normal length of fetal kidneys: sonographic study in 397 obstetric patients. Cohen HL, Cooper J, Eisenberg P, et al. *AJR Am J Roentgenol*. 1991;157:545–548. doi: 10.2214/ajr.157.3.1872242.
7. A cross-sectional study of changes in fetal renal size with gestation in appropriate- and small-for-gestational-age fetuses. Konje JC, Okaro CI, Bell SC, de Chazal R, Taylor DJ. *Ultrasound Obstet Gynecol*. 1997;10:22–26. doi: 10.1046/j.1469-0705.1997.10010022.x.
8. Ultrasonic evaluation of kidney length in term and preterm infants. Chiara A, Chirico G, Barbanni M, DeVecchi E, Rondini G. [https:// link. springer. com/article/10.1007/ BF01995855#Abs1](https://link.springer.com/article/10.1007/BF01995855#Abs1). *Eur J Pediatr*. 1989;4:94–95. doi: 10.1007/BF01995855.
9. Ultrasound measurement of kidney dimensions in premature neonates. Esmaeili M, Keshaki M, Younesi L, Karimani A, Otoukesh H, Esmaeili M. *Int J Pediatr*. 2020;8:12235–12242.
10. Cohen HL, Cooper J, Eisenberg P, Mandel FS, Gross BR, Goldman MA, et al. Normal length of fetal kidneys: Sonographic study in 397 obstetric patients. *AJR Am J Roentgenol* 1991;157:545-8.
11. Konje JC, Abrams KR, Bell SC, Taylor DJ. Determination of gestational age after the 24th week of gestation from fetal kidney length measurements. *Ultrasound Obstet Gynecol* 2002;19:592-7.
12. Determination of gestational age after the 24th week of gestation from fetal kidney length measurements. Konje JC, Abrams KR, Bell SC, Taylor DJ. *Ultrasound Obstet Gynecol*. 2002;19:592–597. doi: 10.1046/j.1469-0705.2002.00704.x.
13. Das SK, Acharya I, Pariida S, Mohanty J, Singh M, Swain BM. Correlation of Gestational Age with Fetal Renal Length in Third Trimester Pregnancy. *J Med Sci Health* 2018;4(1):18-22.
14. Peter M, Nayak AK, Giri PP, Jain MK. Fetal kidney length as a parameter for determination of gestational age from 20th week to term in healthy women with uncomplicated pregnancy. *Int J Res Med Sci* 2017;5:1869-73.
15. Al-Mlah S, Nasef A, El-Masry HA. Assessment of fetal kidney length as a parameter for detection of gestational age at the third trimester of pregnancy. *The Egyptian Journal of Hospital Medicine*. 2019 Apr 1;75(5):2839-44